Evaluating and Shaping the Impacts of EVs on Customers

Tools for Consumer Advocates

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Bruce Biewald, Melissa Whited

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Agenda

Background

Evaluating

Shaping

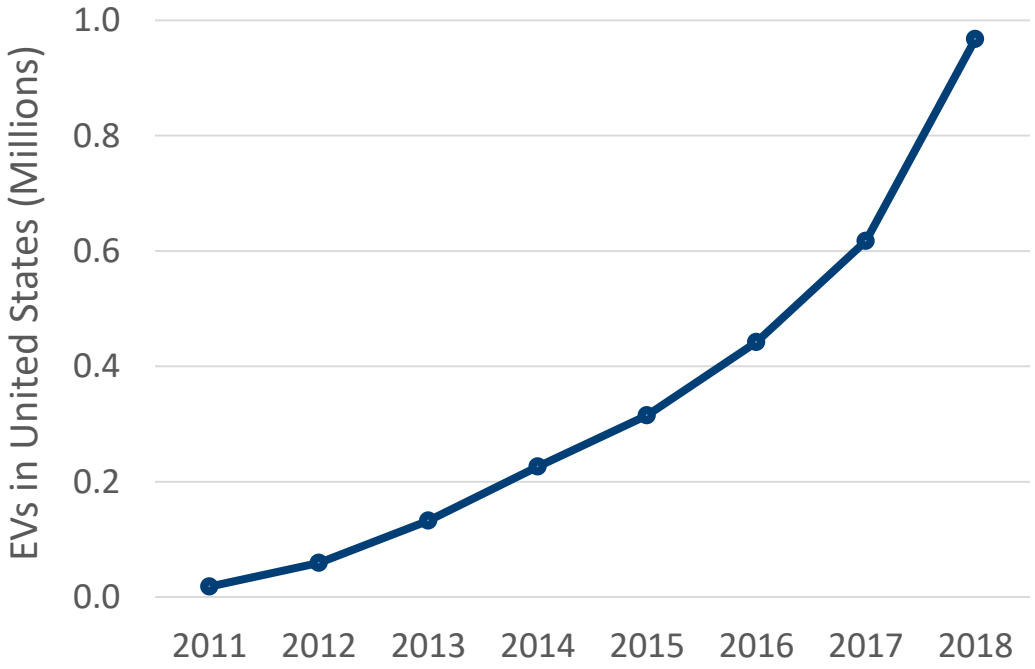
1. **Why** the focus on EVs?
2. What are the impacts of EVs on **electric utility customers**?
3. What are the **broader public interest impacts** of transportation electrification?
4. **What actions and policies can help maximize the benefits of EVs for all customers**, including non-EV owners?

From our forthcoming publication: "*Analyzing the Customer Impacts of Electric Vehicles: A Guidebook for Consumer Advocates*"

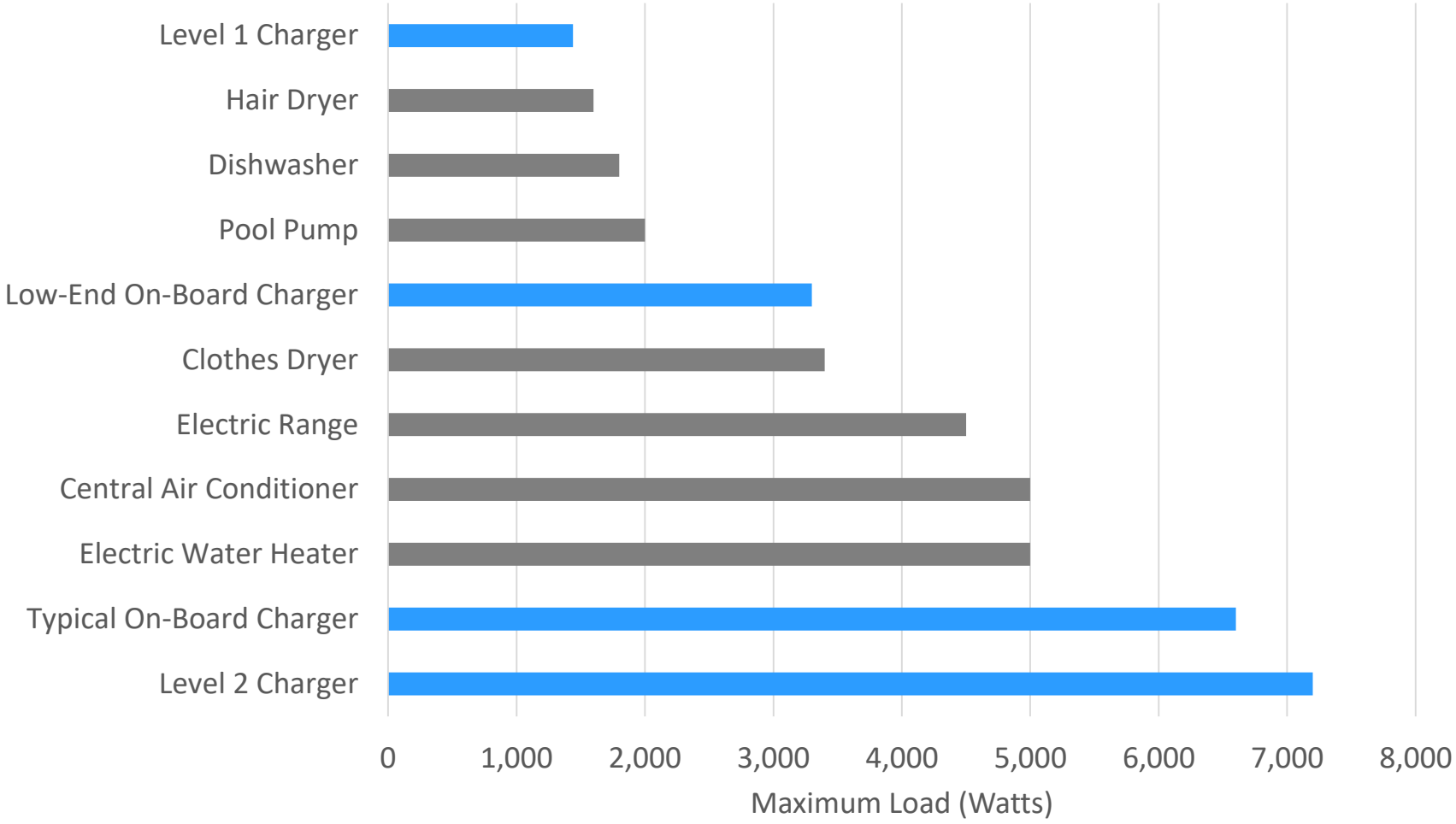
Why EVs?

#1: They're coming

- EV sales increased by ~80% in 2018
- We need to have good policies in place to manage the additional load
- We need to make sure the benefits and costs are felt equitably



#2: Can significantly increase peak demand



#3: Potential for large customer benefits

Rate reductions for ALL customers

- More efficient use of grid capacity (spread out the fixed costs)
- Better use of low-cost renewables during off-peak hours
- Cost-effective way to meet state environmental goals

Lower total cost of ownership

- Reduced maintenance and fuel costs can save customers money
- Reduced public transit costs

Health and environmental benefits for all customers

- Lower criteria pollutants & mercury = reduced health impacts
- Reduced greenhouse gases

Evaluating the impacts

Evaluating the Impacts

1. What are the impacts of EVs on **electric utility customers** (particularly non-EV owners)?
    - Rate impacts
2. What are the **broader public interest impacts** of transportation electrification?
    - Health impacts
    - Economic impacts

Analysis tools, data

Utility system costs

- Production cost models, capacity expansion models, transmission and distribution planning studies

Rate impacts

- Revenue requirements, electricity sales, rate designs

Total cost of ownership

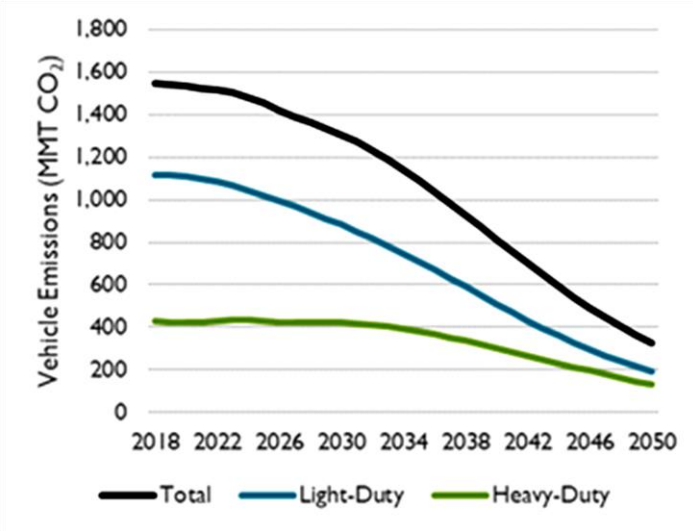
- Up-front costs, financing costs, rebates/incentives, fuel costs, maintenance costs

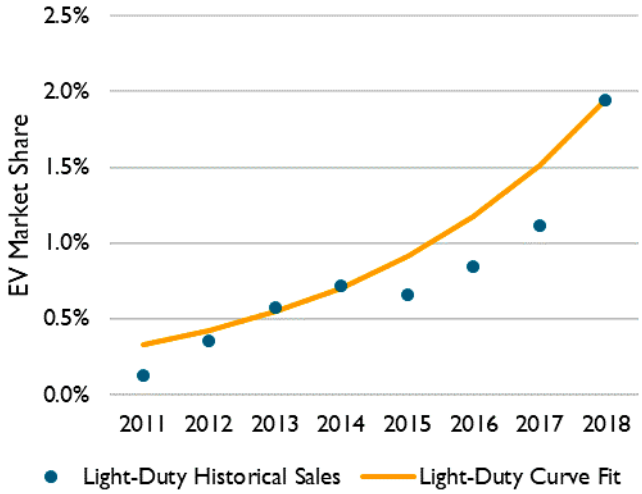
Health & pollution impacts

- Emissions from vehicles, emissions from electric grid, health impacts (BenMAP, COBRA)

Synapse's EV-REDI

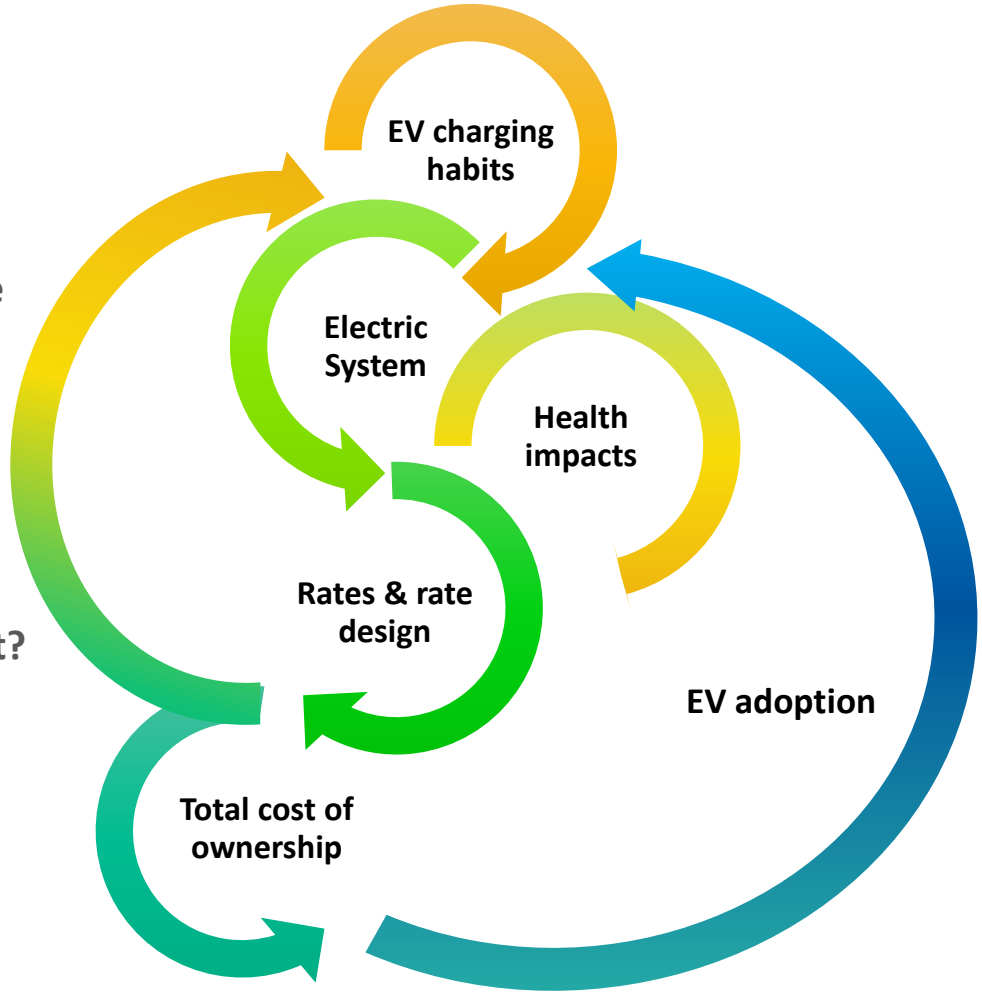
- EV adoption curves
- Six types of EVs
- Electricity consumption from EVs
- Avoided fossil fuels
- Emissions





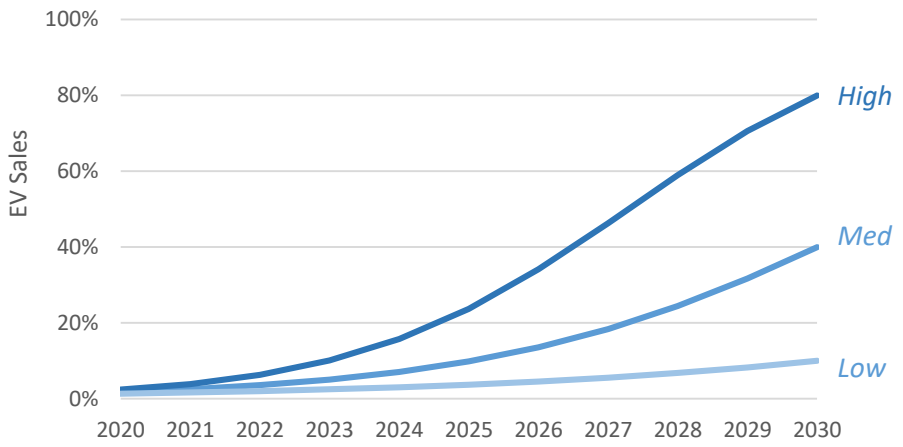
Intertwined impacts

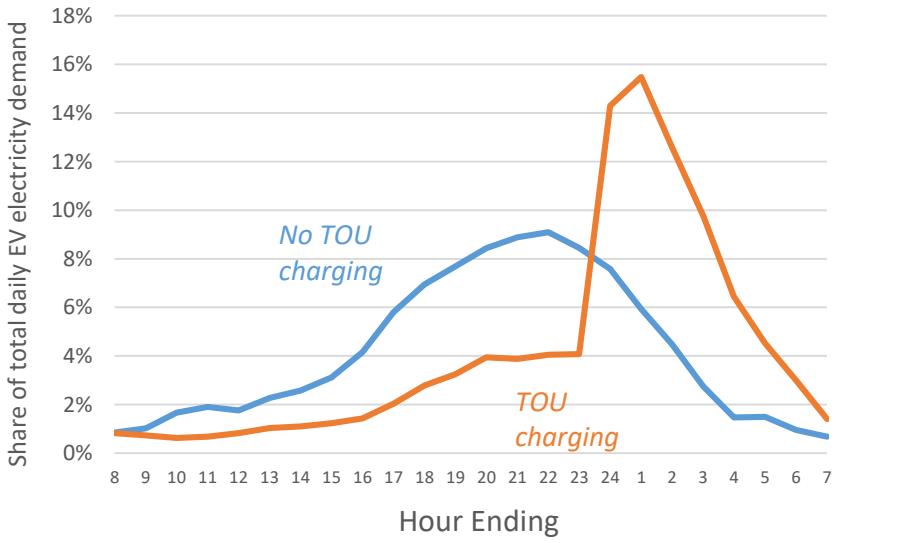
- When do EVs charge?
- Additional generation, T&D?
- Which generation resources are deployed?
- What is the impact on rates?
- What's the cost to charge EVs?
- What's the total ownership cost?
- How do emissions change?



Setting up the analysis

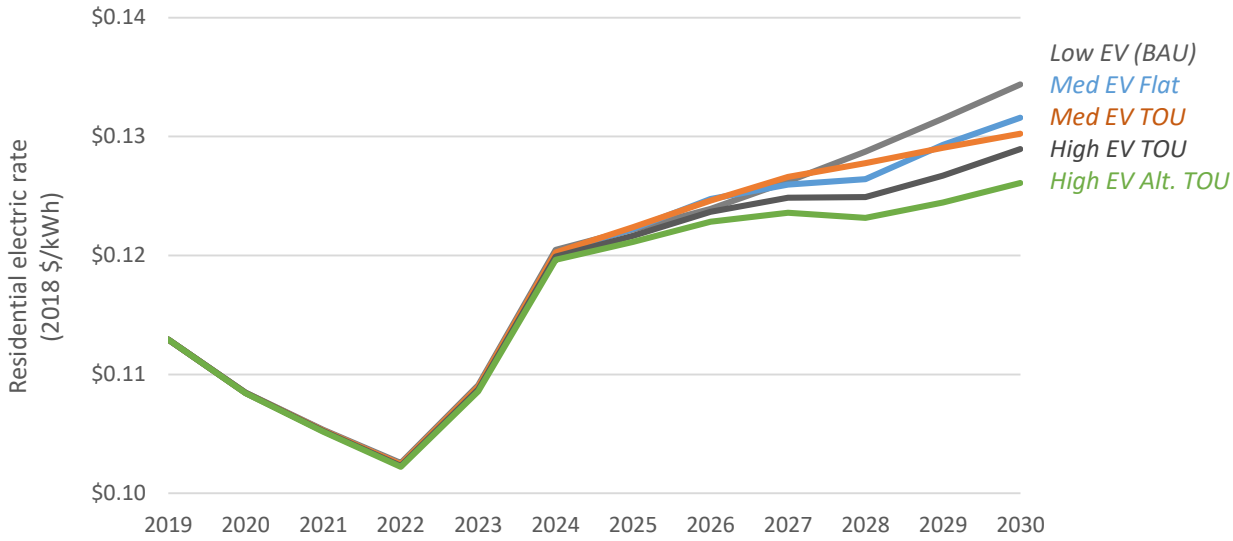
- Analysis timeframe
  - 10-15 years, or longer
- EV adoption scenarios
  - E.g., High/med/low
- EV charging scenarios
  - E.g., TOU vs. flat rates
- Ratepayer-funded EV programs





Example Results

- How do rates change over time?



- What are the health impacts relative to BAU?

	Avoided Deaths	Avoided Work Loss Days	Monetized Health Impact (2018 $M)
Med EV Scenario	20	8,600	$178
High EV Scenario	90	44,000	$920

- What are the cost of ownership impacts?

	Low EV - BAU	Med. EV & Flat Rates	Med EV & TOU Rates	High EV & Flat Rates	High EV & TOU Rates
Car	-$3,700	-$3,100	-$3,600	-$3,100	-$3,700
SUV	-$7,000	-$5,900	-$7,000	-$6,000	-$7,000
Bus	-$139,300	-$114,500	-$137,600	-$116,900	-$139,300

Policies to shape transportation electrification

Maximize benefits while minimizing costs

Promote equitable distribution of the benefits

1. Policies to maximize benefits & minimize costs

- Implement **sound rate design principles**
  - Shift new EV load toward the least-constrained hours, minimizing the costs that are imposed on the utility system and maximizing the positive impact that increased energy sales have on rates and bills.
  - Time-of-use rates, critical peak pricing, etc.
  - Designing rates is not enough – must ensure enrollment

- Use **demand response** programs
  - Reduce peak demand
  - Help balance supply and demand to optimize the use of zero-emitting resources or to avoid use of expensive or highly polluting peak resources.

1. Policies to maximize benefits & minimize costs (cont.)

- **Site public charging infrastructure** in locations that minimize the need for distribution system upgrades.
  - Are utilities providing this information to charging station developers?

- Ensure costs of ratepayer-funded EV programs **do not outweigh benefits**
  - Leverage other funding sources where possible
  - Ensure utility investments are providing value, not redundant
  - Collaboration in program design among utilities, consumer advocates, other government agencies can lead to greatest benefits
    - E.g., federal funds for transit electrification

2. Promote equitable distribution of the benefits

- **Design utility EV incentives to benefit low-income customers**
  - Low-income customers may not be able to take advantage of tax incentives
  - Up-front rebates more helpful for low- & moderate-income customers
  - Incentives can target lower cost EVs, used EVs, or vehicle leases (as opposed to only new car purchases)
  - Income guidelines to provide larger rebates for those with lower incomes

- **Collaborative** process with underserved communities
  - What are their specific needs?
    - Varies by community
  - Do they want to own/lease vehicles? Or is transit a better option?

2. Promote equitable distribution of the benefits

- **Direct EV investments to services relied on by lower-income customers**
  - Target services that low-income or non-driving customers may rely on, such as public transit, school buses, mobility services
  - Public charging infrastructure that serves multi-unit dwellings, mobility service drivers, and low-income areas.
  - Ride-hailing services (Uber/Lyft):
    - Drivers disproportionately low-income
    - Lower operational costs can benefit underserved communities

- **Electrify vehicles with greatest health impacts in lower-income communities**
  - School buses, yard trucks at ports, delivery trucks in urban areas, or heavy trucking on freeways
  - Ride-hailing vehicles

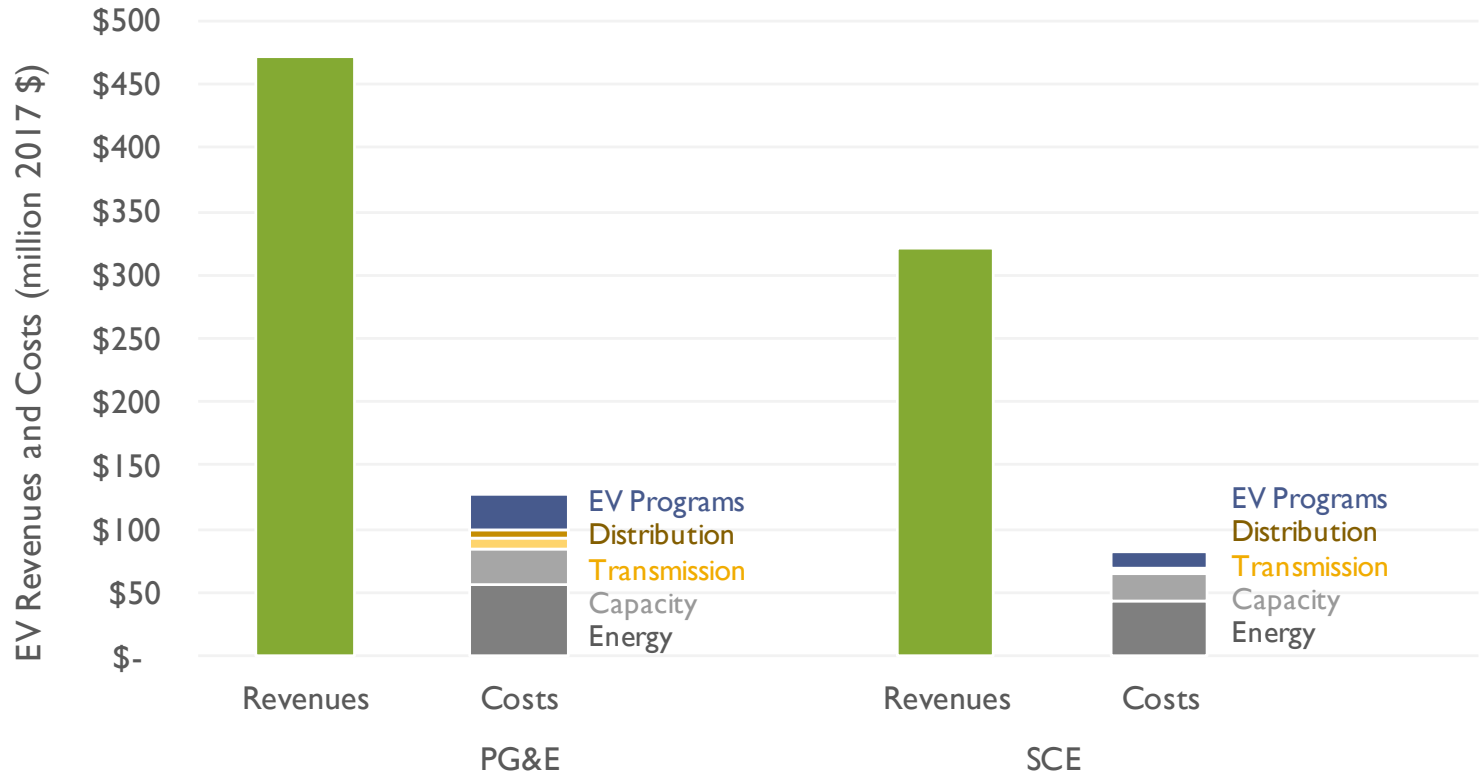
Real world example

California

- By far the most EVs in the country
  - Approximately half of EVs in the United States
  - Nearly 10% of new cars purchased are EVs
- Commission requires utilities to report data regarding EV customer load profiles and system upgrades to accommodate EVs
- EV TOU rates have effectively encouraged off-peak charging in California
  - 85% - 90% of charging on TOU rates is off-peak
  - Only ~25% of EV drivers are on TOU rates currently.
- From 2011-2018, only one out of every 670 EVs (0.01%) has resulted in a distribution system or service line upgrade.

California

- To date, EV drivers have provided far more revenues than costs
  - Most drivers currently paying high tiered rates
  - But finding holds if we assume 75% of EV drivers pay mostly low, off-peak rates



Contact

Melissa Whited
Synapse Energy Economics

617-661-3248
mwhited@synapse-energy.com
www.synapse-energy.com

About Synapse Energy Economics

- Synapse Energy Economics is a research and consulting firm specializing in energy, economic, and environmental topics. Since its inception in 1996, Synapse has grown to become a leader in providing rigorous analysis of the electric power sector for public interest and governmental clients.
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- Located in Cambridge, Massachusetts